

# **Bedrock Aquifer Systems of Randolph County, Indiana**

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The occurrence of bedrock aquifers depends on the original composition of the rocks and subsequent changes which influence the hydraulic properties. Post-depositional processes which promote jointing, fracturing, and solution activity of exposed bedrock generally increase the hydraulic conductivity (permeability) of the upper portion of bedrock aquifer systems. Because permeability in many places is greatest near the bedrock surface, bedrock units within the upper 100 feet are commonly the most productive aquifers. In Randolph County, rock types exposed at the bedrock surface include moderately productive limestones and dolomites with varying amounts of interbedded shale, and unproductive shales with interbedded limestone.

Bedrock aquifer systems in Randolph County are overlain by unconsolidated deposits of varying thickness, ranging from less than one foot to approximately 300 feet. Most of the bedrock aquifers in the county are under confined conditions. In other words, the potentiometric surface (water level) in most wells completed in bedrock rises above the top of the water-bearing zone.

The yield of a bedrock aquifer depends on its hydraulic characteristics and the nature of the overlying deposits. Shale and clay act as aquitards, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquitards, which can increase recharge to the underlying aquifers. Hydraulic properties of the bedrock aquifers are extremely variable.

Two bedrock aquifer systems are identified for Randolph County. They are, from younger to older; the Silurian and Devonian Carbonates, and the Maquoketa Group of Ordovician age. Bedrock aquifers are fairly productive in this county. Bedrock wells represent about one-third of all wells completed in Randolph County.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. However, because bedrock aquifer systems may have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

## **Silurian and Devonian Carbonates Aquifer System**

In Randolph County, the younger Devonian age carbonates are not present and this aquifer system consists only of Silurian age carbonates. The Silurian and Devonian Carbonates Aquifer System outcrops/subcrops throughout much of Randolph County. The total thickness of this system in the county ranges from 0 to about 200 feet.

In Randolph County, wells penetrating the Silurian and Devonian Carbonates Aquifer System have reported depths ranging from 35 to 380 feet, but are commonly 100 to 180 feet deep. The amount of rock penetrated in this system typically ranges from 20 to 70 feet, although many of the deeper wells also reach the upper portion of the underlying Maquoketa Group.

Wells utilizing the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic users and some high-capacity users in this county. Domestic well yields commonly range from 10 to 35 gallons per minute (gpm). Static water levels typically range from 15 to 35 feet below the land surface. A few flowing wells have been reported for this bedrock aquifer system in the county. There are 8 registered significant ground-water withdrawal facilities (12 wells) utilizing the Silurian and Devonian Carbonates Aquifer System in Randolph County. Reported yields range from 80 to 600 gpm. High-capacity well depths range from approximately 40 to 400 feet below the land surface. Several of the high-capacity wells have contributions from both the Silurian and Devonian Carbonates Aquifer System and the underlying Maquoketa Group Aquifer System.

This aquifer system is generally not very susceptible to surface contamination due to thick clay deposits over most of the county. However, solution features (caves) are described in a few well records suggesting minor karst development and there are localized areas, especially near the White River and the Mississinewa River, where the bedrock surface is shallow or exposed. These areas, therefore, are at moderate to high risk to contamination.

### **Ordovician -- Maquoketa Group Aquifer System**

The outcrop/subcrop area of this aquifer system is limited to the three main bedrock valleys in this county. The Maquoketa Group consists mostly of shales with interbedded limestone units. Although the Maquoketa Group Aquifer system is approximately 800 to 900 feet thick in the county, typically little more than the top 100 feet is used for water production.

In Randolph County, some wells completed in the Maquoketa Group Aquifer System are open to and receive some water from the Silurian and Devonian Carbonates Aquifer System. However, wells completed solely in the Maquoketa Group Aquifer System are generally capable of meeting the needs of domestic users in this county. Wells exclusively utilizing the Maquoketa Group Aquifer System in Randolph County have reported depths ranging from 79 to 423 feet, but are commonly 120 to 300 feet deep. The amount of rock penetrated in this system typically ranges from 20 to 80 feet. Yields for domestic wells generally range from 10 to 30 gpm and static water levels are commonly 10 to 25 feet below the land surface.

The Maquoketa Group Aquifer System is generally not very susceptible to contamination from the land surface because thick layers of clay-rich material overlie the bedrock.

### **Registered Significant Ground-Water Withdrawal Facilities**

There are 8 registered significant ground-water withdrawal facilities (total of 12 wells) using bedrock aquifers in the county. All of these wells tap the Silurian and Devonian Carbonates Aquifer System including several wells that also have a contribution from the Maquoketa Group

Aquifer System. Reported capacities for individual wells range from 80 to 600 gpm. Refer to the table for some details on the wells and to the map for the facility location.

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